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The Scandinavian Society of the Foot (Nordisk Förening för Podologi) was founded in Stockholm on October 4, 1985. Each Scandinavian country is represented on the board, whose members are Uffe Jørgensen (Denmark), Jarl-Erik Michelsson (Finland), Halldor Jonsson Jr. (Iceland), Kjell Nökleby (Norway), and Gert Walheim (Sweden).

The society will promote research and education in podology and different specialists interested in foot problems, such as orthopedic surgeons, shoe and orthosis technicians, foot therapists, and physiotherapists, are invited to participate in the meetings of the society.

Abstracts from the first meeting of the society at Trondheim, Norway are presented below.

A simplified use of rotation vectors to study the joint movements in the foot

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The movements between the different segments of the foot are complex due to the oblique orientation of the axes of the different joints with respect to the principal axes of the foot. It is difficult to interpret the relation between the complex movements of the segments and the axes of the joints.

By using three-dimensional rotational vectors, placing them in the joint and orienting their components with respect to the three principal axes of the foot, the above-mentioned phenomenon can easily be explained.

For example, the components of the rotation vector, which is placed in the subtalar joint, show how the plantar flexion, adduction, and supination, and vice versa, dorsiflexion, abduction and, pronation are linked together and the proportion between these movements.

The use of this method explains how a deviation from the normal orientation of the axes of the joints influences the size of each component.

An in vivo kinematic analysis of the human foot

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The movements of the fibula and the pattern of motion of the joints of the longitudinal arch of the foot in dorsiflexion (df) and plantar flexion (pf) have been assessed by roentgenstereophotogrammetry. Tantalum balls, 0.8 mm in diameter, were introduced as bone markers into the tibia, fibula, talus, calcaneus, navicular, medial cuneiform, and first metatarsal bones of four healthy subjects. During the examination, the subjects were standing on a platform that could be tilted in the sagittal plane. Simultaneous AP and lateral views were obtained in 10° increments from 30° of df to 30° of pf, and under full body load.

1. In the frontal plane, the fibula showed a uniform medial translation from df to pf with a decrease of the mortise width of approximately 0.5 mm in the neutral position to 30° of df, and a slightly larger decrease in width at 30° of pf. The greatest total change in width (in the 4 subjects) was 1.5 mm.

2. No rotation of the fibula about its own axis exceeding 2.5° was found.

3. The rotation about the transverse axis was distributed among all the joints examined, but with only a very small contribution from the joint between the cuneiform and the metatarsal. In df the major part of the motion occurred in the talocrural joint, but in pf the pattern was more complex and varied between the individuals.

In this study the changes in width of the ankle mortise followed a uniform pattern; the rotation of the fibula was small; and the distribution of sagittal rotation within the foot varied among the subjects.

Experimental lateral instability in subtalar joint following transection of the calcaneofibular ligament

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The purpose of the present study was to evaluate the lateral stabilizing effect of the calcaneofibular ligament on the subtalar joint.

A standard experimental set-up was used to measure the mobility patterns of the total ankle-talocalcaneal joint complex (TTC) and the talocalcaneal joint (TCJ) in 10 osteoligamentous preparations. Continuous registration during plantar-dorsiflexion (PF–DF) was made with a constant moment (1.5 Nm) applied to the calcaneus in adduction.

Adduction in both TTC and TCJ was found to increase significantly after cutting the calcaneofibular ligament. In the interval 7.5° of PF to 5° of DF the adduction in TCJ increased gradually from 3.1° to 4.6° with DF. In TTC the increment was from 3.0° to 7.0°.

This study has shown that the calcaneofibular ligament is an important structure in preventing lateral subtalar joint instability. The adduction in the subtalar joint was found to increase with dorsal flexion after cutting the ligament.

Individual variation in the heel pad shock absorbency

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The purpose of this study was to find and compare the shock absorbency of the factors involved in the shoe/heal-foot interaction at heel strike.

In order to imitate heel strike, drop tests were performed on 1- cm test specimens from 0.1 m with a 1.615 kg missile. The ground reaction forces were measured on an AMTI(R)-force plate and the reaction forces registered in an accelerometer attached to the missile.

The shock attenuation in the 1-cm test specimens, expressed as peak force reduction, was found to be greatest in the heel pad, 1.4 times that of EVA-foam-sole component and 2.6 times that of Sorbothane (R) (inserts). For average force reduction, the ratios were 1.6 and 2.4, respectively. A significant variation was only found in the heel pads (10 cadaver specimens), with variations up to 100 per cent ($P<0.01$).

It can be concluded that the heel pad is the potentially most important factor in the shoe/heel-foot interaction with respect to force reduction at heel strike. The interindividual variation supports the clinical observations that heel-pad shock-absorbency loss predisposes to heel strike-dependent fatigue injuries.

Interaction between foot and shoe

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The most important function of the shoe is to protect and increase the functional capacity of the foot. This can be achieved by a balanced interaction between the mechanical characteristics of the foot and shoe. The orthopedic shoe has to replace the mechanical function that the diseased foot has lost. An orthosis is needed when the shoe alone can no longer replace the lost function of the diseased foot.

Mechanical cooperation requires that the shoe meets certain basic principles. The foot must be kept firmly in the shoe, without shearing. The sole should be stiff from posterior edge to just proximal of the metatarsal heads. The volume of the shoe should not change by applying elastic lacing or soft insoles. The toe cap should be of sufficient size to leave space for the toes; it is especially important that the big toe is not pressed into a valgus position. The length of the foot is measured with the patient standing on the toes. Lengthening of the sole for cosmetic disguise of a short foot can double the load of the metatarsal head at push off.

The localization of foot ulcers were plotted in a three-dimensional chart to compare the injury caused by men's and women's shoes on neuropathic feet. Examination of 99 male and 110 female feet with foot ulcers showed no certain difference between the localization of the ulcers. It was concluded that industrially produced men's shoes give rise to foot ulcers in the same localization as women's shoes.

The radiography of the feet

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Radiographs of the feet are usually taken with the patient sitting with the feet on the x-ray table. Radiographs in frontal view taken in this position show the feet in too much supination due to lack of body weight. Ordinary lateral radiographs project the feet in a

frontal-lateral plane so that the metatarsal and phalangeal bones can be distinguished from each other.

Radiographs of the feet with the patient sitting with the feet on the x-ray table are a poor basis for evaluating foot deformity.

Standing radiographs should be obtained in addition to the ordinary lateral projection. This is particularly important in deformities such as hallux valgus, pes planus, pes planovalgus, and pes cavus, especially to demonstrate the position of the bones of the foot.

Frontal radiographs should be taken with the patient standing with the x-ray tube at an angle of 20 degrees to the vertical line (perpendicular to the metatarsus), and lateral radiographs should be taken directly from the side parallel with the floor.

In radiographs taken in this fashion, the intermetatarsal angle is normally 6 to 9 degrees, and the distance between the heads of the first and second metatarsal bones does not exceed 5 mm.

Computed tomography in the evaluation of forefoot deformity

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To evaluate the forefoot anatomy in the transverse direction, CT scans have been used to obtain detailed information about the transverse metatarsal arch of the forefoot.

CT scans provide a picture of the transverse metatarsal arch of both feet, the relations of the metatarsal heads, the rotation of the metatarsal bones, and the positions of the sesamoid bones.

Seven patients and 1 healthy subject have been evaluated with CT scans: preoperatively and postoperatively in five metatarsal osteotomies and two suspected cases of Mb Morton. One case was scanned both with and without pressure; the others, without pressure.

To see the position of the transverse metatarsal arch on the metatarsophalangeal joints, pictures with and without pressure can be combined. With suspicion of Mb Morton or tumors, CT scans can be used for diagnostics.

Subcalcaneal pain conditions

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The increase in sports activity has resulted in an increased frequency of overuse/overload injuries, particularly in runners. Subcalcaneal pain may be difficult to diagnose and treat. Subcalcaneal pain can be due to systemic disease (connective tissue diseases), radiating pain, or locally produced pain. Local factors implicated in subcalcaneal pain include heal spur, fasciitis plantaris, entrapment neuropathies, inflammation due to direct mechanical stress, tendon inflammation, calcifications in the heel pad, and projection of pain from neighboring regions.

Subcalcaneal pain includes several entities of different origin, and to achieve therapeutic success, differentiation in diagnoses and treatment is essential.

Calcaneal pain conditions

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Pain localized in the calcaneal region differs from subcalcaneal pain conditions in etiology, diagnostics, and treatment.

Calcaneal pain conditions can be divided into those affecting bone and those affecting soft tissues. The former are stress fractures, osteomyelitis, tumors, and apophysitis, whereas the latter include tendon inflammation and bursitis. The tendons that can be inflamed at the calcaneal level are the flexor hallucis longus, tibialis posterior, and the peroneals.

Inflammation of the retrocalcaneal and the subcutaneous bursa and the Achilles tendon insertion are included in calcaneal pain conditions.

Neonatal operative treatment of clubfoot

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The purpose of primary operative treatment of clubfoot is to reach comparable results with a single operation as with a long and laborious conservative treatment.

During the period from 1974 to 1979, 94 classical rigid clubfeet in 67 patients were consecutively operated on. The mean age at operation was 12 days. The operation included elongation of the Achilles tendon in all the feet, posterior capsulotomy in 76 per cent, elongation of the tibialis posterior and capsulotomy of the talonavicular joint in 67 per cent, and plantotomy in 57 per cent.

The results were assessed 4 (1–7) years postoperatively and were graded in three groups according to Main et al. (1977). After the primary operation, 90 per cent of

the feet were classified as excellent or good. Further operations were performed in 17 feet, and at follow-up 70 per cent were classified as excellent, 29 per cent as good, and 1 per cent as poor.

The results are as good or even better than obtained with conservative or combined treatment. The method has many advantages, but implies risk factors that might lead to results inferior to conservative treatment.

Treatment of tailor's ankle by oblique subcapitular sliding osteotomy

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Increased width of the forepart of the foot with a laterally prominent fifth metatarsal head is commonly referred to as tailor's ankle. In rare cases when the lateral prominence is pronounced with a clavus formation, this condition can be a source of symptoms that warrants surgical treatment.

Eight feet in 5 patients (15-20 years) with tailor's ankle were operated on by an oblique subcapitular sliding osteotomy on the fifth metatarsal bone. Prior to surgery, none of the patients could wear ordinary shoes because of shoe pressure.

All the patients can now use ordinary shoes and all the osteotomies have united; however, in one osteotomy, union was delayed.

Subtalar arthrodesis of the rheumatoid foot

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Rheumatoid synovitis will sooner or later involve all three subtalar joints causing pain in the ankle, tenosynovitis at both malleoli, and sometimes varus or valgus deformity. Radiographs are seldom of help in diagnosing the process.

Twenty subtalar triple arthrodeses were performed between 1973 and 1984. The mean age of the patients was 50 years. Indications for surgery were pain, swelling, and varus or valgus tilting of the foot. Stabilization of the foot before ankle joint arthroplasty was a further indication. A plaster cast was used for 9–10 weeks postoperatively.

At follow-up 4.5 (0.5–11) years postoperatively, all the feet with varus or valgus deformities were corrected and most joints were painless. After 4 months, 15 of 20 of the arthrodeses were fused radiographically. Bony consolidation was delayed until 18 months postoperatively in 5 cases. There were no serious complications.

Triple arthrodesis of the rheumatoid foot is a safe procedure with good pain relief. It has a great value in correction of the mechanical axis of the leg and should be included in planning for talocrural and knee arthroplasties.

Metatarsal osteotomy with internal fixation of forefoot deformities

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Bunion deformity, prolapse of the metatarsal heads, and tailor's ankle frequently necessitate surgical correction. If a precise preoperative evaluation can be done, it is possible to achieve optimal correction of the position of the metatarsophalangeal joint by metatarsal osteotomies followed by internal fixation. Frequently, the procedure has to be combined with soft-tissue operations, such as capsulotomy and tendon lengthening.

We performed 37 osteotomies on 21 feet. Most osteotomies were performed on the second and third metatarsals. The patients used crutches for 3 to 4 weeks after surgery to avoid weight bearing on the forefoot; no cast or splint was used. The follow-up period was 3 months to 3 years.

No infections or nonunions occurred. The mean period of absence from work was 8 weeks. All the patients but 1 were satisfied with the results of the operation. By using this method for moderately advanced deformities, metatarsal head resection can be avoided.

Treatment of foot ulcers and gangrenes

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In the population of Norrköping, 175 of 100,000 inhabitants per year need orthopedic care for foot ulcers. At the foot section, 515 patients were treated during 1983 and 1984. The 267 diabetics had a mean age of 72 years and a mean duration of the disease of 14 years. All the ulcers were graded according to Bernhard Meggitt's classification and the ankle-to-arm blood pressure index was estimated.

The treatment involved protection of the ulcers by a walking cast, walking bed, and treatment shoe. Auto-

amputation was preferred to partial foot amputation, Syme's amputation to below-the-knee amputation, and through-knee amputation was preferred to-above-knee amputation.

The ankle-to-arm pressure index decreased with increasing age, and the ulcers were more serious. At an index >0.45, healing was achieved in 88 per cent; but even at an index of 0.20 to 0.44, 48 per cent of the ulcers healed. The total amputation frequency per 100,000 inhabitants per year and mean age at amputation were for Syme's amputation 2.1 (mean 73 years); below-knee amputation, 20.7 (mean 77 years); through-knee amputation, 25.2 (mean 80 years); and above-knee amputation, 9.7 (mean 78 years).

Diabetic osteopathy: Report of a case

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A woman, born 1919, with onset of diabetes in 1960, was hospitalized in January 1979, with symptoms regarded, and treated, as erysipelas. Radiographs taken soon after admission revealed osteolysis, fragmentation, and subluxations in the tarsometatarsal region, predominantly of the right foot.

The skeletal changes progressed during the following 5 years with increasing foot deformity and a nonhealing ulcer in the midplantar region of the right foot, which was first observed in 1980.

In 1985, the treatment was changed to nonweight bearing with a plaster cast, and the ulcer healed uneventfully within 3 months. The patient has been free of ulcer since then, protected with custom-made shoes with individually made insoles.

This is an illustrative case of advanced diabetic osteopathy with trophic ulceration on the point of maximum load. Radiographic changes were observed not only tarsally, but also distally in three metatarsals. These lesions healed spontaneously, which is characteristic of diabetic osteopathy.

The patient's status today is that of collapse of the normal foot architecture and anchylosis between engaged skeletal parts. This probably represents the final outcome of diabetic osteopathy. It is essential to recognize the changes because the loss of foot elasticity increases the risk of trophic ulcers.